

TOPAS

Traffic Open Products and Specifications

TOPAS 2516B

Performance Specification for Discontinuous Variable Message Signs

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TOPAS 2516B

PERFORMANCE SPECIFICATION FOR DISCONTINUOUS VARIABLE MESSAGE SIGNS

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1 INTRODUCTION

- 1.1 This specification covers the performance requirements for the control of Discontinuous Variable Message Signs that are intended for use on UK public highways. TOPAS specifications are explicitly purchasing specifications and compliance with them is not mandatory. However Local and other Purchasing Authorities may typically require that equipment purchased complies with TOPAS specifications and is TOPAS registered.
- 1.2 Manufacturers may register products as being compliant with this specification, using the process defined in TOPAS 0600
- 1.3 TOPAS registration requires manufacturers submit a Technical File to an appropriate Technical Assessor to aid compliance verification. The content requirement for the Technical File is defined in Appendix Z of this specification.
- 1.4 Guidance to potential users of this Product is given in Appendix A.
- 1.5 Within this specification, "The Product" shall mean all components necessary to provide a complete operational unit meeting the requirements of this specification and the common requirements defined in TOPAS0600.

Implementation

- 1.6 This specification implements requirements as originally defined in HA specification TR 2516B. Product Approvals to TR 2516B may be used to register products to this specification as defined in TOPAS 0600
- 1.7 This specification will be immediately implemented from the date of issue for all new TOPAS Registrations

Authorisation

- 1.8 In England, any legend or symbol intended to be displayed on a signal or sign face shall be either prescribed by the TSRGD or shall have received separate authorisation from the Department for Transport (DfT). In Scotland and Wales the devolved Assemblies provide a similar role. In Northern Ireland the Department for Regional Development undertakes this role. In Scotland the Transport Group of the Scottish Executive provide a similar role.

Glossary of Terms

- 1.9 A comprehensive glossary of terms is given in Highways Agency document TA 84 Code of Practice for Traffic Control and Information Systems for All-purpose Roads.

2 EUROPEAN HARMONISED STANDARDS

General

BS EN 12966-1:2005 (Optical)

2.1 Discontinuous Message Signs shall meet the requirements of European Harmonised Standards BS EN 12966-1:2005 Road vertical signs - Variable Message Traffic signs. Product standard.

2.2 In order to allow for future developments in technology, the Specification uses performance requirements which are independent of technology and whose optical/visual performance can be demonstrated on test modules.

2.3 Where these documents provide alternatives for variations to requirements by the definition of different classes, it is recommended that a Product intended for use on all-purpose roads, not managed by an Approval Authority, meets the requirements of the classes set out in the following tables. Where the Product is intended for use on a motorway or trunk road, managed by the Approval Authority, the classes set out in the following tables shall be used.

BS EN 12966-1:2005 (Text Dimensions)

Stroke Width	s	Width of the an element
Character Height	h	Character height = stroke width x number of vertical elements
Character Width (min.)	w	5/7 h
Character Spacing (min.)	sc	2/7 h
Word Spacing (min.)	sw	5/7 h
Line Spacing (min.)	sl	4/7 h

Table 2.1

White	Colour Chromaticity Area		Area 5 (C2)
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
Wide		B3	
Yellow	Colour Chromaticity Area		Area 6 (Yellow C2)
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
Wide		B3	
Green	Colour Chromaticity Area		Area 2 (Green C2)
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
Wide		B3	
Red	Colour Chromaticity Area		Area 8 (Red C2)
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
Wide		B3	

Table 2.2

BS EN 12966 (Environmental)

Temperature	T1
Pollution	D1
Protection	P2

Table 2.3

3 NATIONAL REQUIREMENTS

- 3.1 This section outlines the UK National performance requirements for all Discontinuous Variable Message Signs intended for use on UK public highways.

Optical Performance Levels

- 3.2 There are two levels of optical performance applicable to Discontinuous Variable Message Signs. The performance level required for any sign is dependent on its intended use.
- 3.3 Optical Performance Level 1 shall be required in the following cases:
- i) For all signs which are (or may be) required to display messages of a mandatory, safety or warning nature.
 - ii) For all signs used on roads with an 85th Percentile speed above 50mph (See table 3.3)
- 3.4 Optical Performance Level 2 may be used for any signs on roads with an 85th Percentile speed up to and including 50mph (See table 3.3)

Sign Selection

- 3.5 Table 3.3 shows standard character size ranges together with their corresponding performance requirements.
- 3.6 Table 3.4 defines the classes required to satisfy optical performance levels 1 and 2. The classes are based on the requirements and classes contained in BS EN 12966-1:2005.

Message and Legend Format

- 3.7 Messages and pictograms (except where separate authorisation has been obtained) shall conform to the standard list of prescribed messages as set out in legislation.

Conspicuity Devices

- 3.8 Flashing amber lamps may be used with signs displaying regulatory and safety messages. Red lamps may also be specified as required by regulation 37 in TSRGD 2002.
- 3.9 The lamps shall display 125mm red or amber signals in accordance with Regulation 46 (7) in TSRGD 2002.
- 3.10 Other sizes of conspicuity device may only be used with separate authorisation.
- 3.11 The colour red or amber for the lamps shall be as defined for the specific colour in Section 2.
- 3.12 Unless otherwise specified the conspicuity device shall have an on-axis luminance intensity between 200cd and 500cd
- 3.13 Red lamps shall have the luminous intensity distribution as indicated in Table 3.1. The 100% value (at 0° horizontal and 0° vertical angles) shall be the actual measured value for the Red signal in 3.12.
- 3.14 Amber lamps shall have the luminous intensity distribution as indicated in Table 3.2. The 100% value (at 0° horizontal and 0° vertical angles) shall be the actual measured value for the Amber signal in 3.12

Red Lantern Intensity Levels (expressed as percentages of the 0°H/0°V)						
Horiz \ Vert	0°	±5°	±10°	±15°	±20°	±30°
0°	100	75	40	10	1	-
-3°	75	60	*	*	*	-
-5°	50	*	20	*	*	-
-10°	12.5	*	*	*	6	-
-20°	1.5	*	*		*	-
* No specific value required but the light intensity at each point shall meet at least the level achieved by the next consecutive measurement						
- No specific value required						

Table 3.1 – Red Lanterns

Amber Lantern Intensity Levels (expressed as percentages of the 0°H/0°V)			
Horiz \ Vert	0°	±5°	±10°
+5°	50	20	*
+2.4°	75	60	*
0°	100	75	40
-5°	12.5	*	6
* No specific value required, but the light intensity at each test point shall meet at least the level achieved by the next consecutive measurement. For vertical values + refers to angle above the horizontal – refers to values below the horizontal			

Table 3.2 – Amber Lanterns

Interface Requirements

- 3.15 The Purchaser must provide adequate information in the works specification relating to the interface requirements between the Product and the equipment from which the Product is to be administered.
- 3.16 It shall be the Design Authority's responsibility to ensure that the interface provided for the sign is compatible with the sign control equipment.
- 3.17 Unless stated in the Procurement Contract, the Product interface shall be one or more of the following:

- ◆ An RS485 2-wire interface as specified in TR 2067;
- ◆ RS232C, CCITT V24 and V28;
- ◆ IEEE 802.3u/100Base-T.

RS485 Interface and Protocol

- 3.18 The message structure used for control of the Product is specified in Highways Agency specifications TR 2070.
- 3.19 The protocol, commands, responses, timing and intermessage delays are specified in specifications TR 2045, TR 2067, TR 2070 and TR 2141.

- 3.20 The Product designer shall consider future roll-outs of digital networks, either hard-wired or virtual.

RS232 Interface and Protocol

- 3.21 Where specified the RS232C interface shall be used in association with a local monitor or via a PSTN interface to a stand-alone message control system.
- 3.22 The message structure and protocol shall be as that defined for the Stand-alone Controller.

IEEE 802.3u Interface

- 3.23 This interface can be used for both control and monitoring functions.
- 3.24 The information pages that contain all the operational logs, meta data and fault status shall be in the form of HTML pages that can be accessed and viewed by an internet explorer utility.
- 3.25 Messaging and control can also be accomplished via this interface where a digital wide area network connection is provisioned in the scheme.

Construction

- 3.26 Lighting units and controllers external to the enclosure of the Product shall be protected to IP55 (Class P1), EN 60529.
- 3.27 Means shall be provided to minimise the generation of condensation forming inside the Product such that the performance is not affected.
- 3.28 Where the enclosure is fabricated from aluminium the materials used and structural design shall conform to BS 8118.

- 3.29 Where specified in the Works Specification, the Design Authority shall develop a structurally compliant enclosure that meets requirements for a passively safe enclosure that could be mounted on a lightweight gantry that conforms to BS EN 12767.

VMS Adjustment

- 3.30 Variable message signs shall be equipped with a means of vertical and horizontal adjustment so that the sign can be correctly aligned to maximise the benefit of the angular field of display according to the carriageway alignment, gradient and vehicle speed.

Environmental

Vibration

- 3.31 Vibration test shall be carried out in accordance with the procedure given in Table 14 of BS-EN 12966-1 for two cycles.

Water Penetration

- 3.32 The water penetration test shall be carried out in accordance with procedure given in Table 16 of BS-EN 12966-1 (Class P2). The equipment shall be switched-on and operational during the tests.

Change of Temperature

- 3.33 The change of temperature test shall follow the procedure given in Table 18 of BS-EN 12966-1 (class T1).

Size Range	85 Percentile Approach Speed (MPH)	Maximum Number Of Words In Message	Min Equivalent Character Height (mm)	Optical Performance Requirements
A	Up to and including 30	3	60	1 or 2
B	Up to and including 40	7	100	1 or 2
C	Up to and including 50	7	160	1 or 2
D	Up to and including 60	7	240	1
E1	Over 60	3	320	1
E2	Over 60	7 (#1)	320	1
F	Over 60	7	400	1

Table 3.3 - Class Selection

NOTE (#1): Messages up to 7 words may be displayed on 320mm character height signs, only if the same message is displayed on two consecutive signs.

Photometric Parameter	Optical Performance	
	Level 1	Level 2
Colour	C2	C2
Luminance	L3	L1
Luminance Ratio	R3	R1
Beam Width	B1 or B3	B1 or B3

Table 3.4 - Optical Performance

4 MOTORWAY SIGNS

4.1 All Motorway Sign Equipment shall meet all the requirements defined in sections 2 and 3 with the following exceptions.

BS EN 12966 (Optical)

All Colours	Luminance	L3
	Luminance Ratio (On Axis)	R3

BS EN 12966 (Physical Performance)

Temperature	T1
Pollution	D2
Protection	P2

Performance

4.2 Motorway Equipment must be submitted for the approval of the Overseeing Organisation and subjected to tests to demonstrate compliance with this specification in accordance with TR 1100.

Reliability

4.3 All Motorway Equipment must comply with the reliability requirements of TR 1100.

Maintenance

4.4 All Motorway Equipment must comply with the maintenance requirements of TR 1100.

4.5 The design and construction must incorporate the requirements of Specification MCH 1349 "Maintenance and Operational Requirements, to be provided with New Systems and Equipment".

4.6 The design and construction of all Equipment shall ensure that the minimum recommended interval between routine maintenance inspections shall be not less than twelve months.

Physical Testing

4.7 All Equipment must be subject to Environmental Testing in accordance with BS EN 12966 – "Road vertical signs – Variable message traffic Signs", TR 2130 "Environmental Tests for Motorway Communications Equipment and Portable and permanent Traffic Control Equipment" and EN 50293 "Electromagnetic Compatibility – Road Traffic Signal Systems – Product Standard".

Environmental Tests

4.8 Unless otherwise stated all Environmental Testing shall be undertaken on Motorway Test Modules as defined in clause 4.20. The Motorway Controller shall be properly installed within a Cabinet Type 600. Interconnecting cables shall be provided to fully represent an operational installation. The appropriate Test Module shall be powered and operational, to exercise the Equipment. The configuration shall be to the approval to the Overseeing Organisation.

Impact

4.9 The test shall follow the procedure given in Table 13 of BS-EN 12966-1. This test shall be carried out on Test Module 1.

Vibration

4.10 The test shall follow the procedure given in Table 14 of BS-EN 12966-1. This test shall be carried out on Test Module 1.

Drop and Topple

- 4.11 The test shall follow the procedure given in TR 2130. Drop test on bottom edge of Test Module 2 on transport frameworks, as supplied (equivalent to packaged). Motorway Controller to be tested in transport packaging.

Bump

- 4.12 The test shall follow the procedure given in TR 2130 using Test Module 1. Motorway Controller to be tested in transport packaging.

Corrosion test

- 4.13 The test shall follow the procedure given in Table 15 of BS-EN 12966-1. This test shall be carried out on Test Module 1. Not required for Motorway Controller.

Water Penetration

- 4.14 The test shall follow the procedure given in Table 16 of BS-EN 12966-1. Internal heaters must be switched off. This test shall be carried out on Test Module 2. Not required for Motorway Controller.

Dust penetration test

- 4.15 The test shall follow the procedure given in Table 17 of BS-EN 12966-1. Internal heaters must be switched off. This test shall be carried out on Test Module 1. Not required for Motorway Controller.

Temperature test

- 4.16 The test shall follow the procedure given in Table 18 of BS-EN 12966-1 (class T1).
- 4.17 Internal heaters must be switched off. This test shall be carried out on Test Module 2.

EMC (EN 50293)

- 4.18 The Equipment must meet the requirements of EN 50293 for: emissions and immunity.
- 4.19 All EMC Testing shall be undertaken on Test Module 2. The Motorway Controller shall be properly installed within a Cabinet Type 600. Interconnecting cables shall be provided to fully represent an operational installation. The Test Module and Controller shall be powered and operational, to exercise the Equipment. The configuration shall be to the approval to the Overseeing Organisation.

Test Modules

- 4.20 There shall be two test modules provided for environmental and EMC testing.
- Test Module 1. This shall be as defined in BS-EN 12966 section 9.1. The Overseeing Organisation shall approve the design of this Test Module.
 - Test Module 2. This shall be a Motorway Display module properly installed within a full-size, fully equipped Enclosure, and manufactured in accordance with the corresponding procurement specification.

Safety

- 4.21 All Motorway Equipment shall comply with the safety requirements of TR 1100.

General

- 4.22 All other requirements of TR 1100 shall be met unless specifically stated otherwise in this document.

5 REFERENCES

General

5.1 Where undated references are listed, the latest issue of the publication applies.

British Standards

5.2 The British Standards Institution, London, publishes British Standards.

BS 5378	Part 1, Safety signs and colours specification for colour and design
BS 5972	Specification for photo-electric control units for road lighting
BS 7671	Requirements for Electrical Installations
BS 7987	Road Traffic Signals Systems
BS 8118	Structural use of Aluminium
BS EN 12368	Traffic Control Equipment – Signal Heads
BS EN 12767	Passive safety of support structures for road equipment - Requirements and test methods
BS EN 12966	Road Vertical Sign - Variable Message – Traffic Signs
BS EN 50293	Electromagnetic Compatibility Road Traffic Signal Systems Product Standard
BS EN 62262	Degrees of protection provided by enclosures for electrical equipment against mechanical impacts (IK code)
BS EN 60068	Environmental testing
BS EN 60529	Degrees of protection provided by enclosures (IP Code)

Specifications

5.3 TOPAS Limited publications are available from www.topasgroup.org.uk

MCH 1649	Procedure for Contractors using the RCC Network for testing NMCS2 hardware and software
MCE 2215	Motorway Signal MK4(MS4) Requirement for Enclosures, Mounting Brackets and Cantilever Structure
MCH 1349	Maintenance & Operational Requirements for New Systems & Equipment
TR 1100	General Specification for Motorway Signs, Signals and Communications equipment
TR 2045	NMCS2 Standard Transponder
TR 2067	NMCS2 RS485 Communication Electrical and Protocol
TR 2070	NMCS2 Message Control Point to Point
TR 2130	Environmental Tests for Motorway Communications Equipment and Portable and Permanent Traffic Control Equipment

TR 2141	Motorway Signals Mark 2 Requirements for Signals and EMS
TOPAS 0600	Self-Certification and Approval of Equipments for the Control of Vehicular and Pedestrian Traffic on Roads

Other Publications

5.4 Other publications can be obtained from the Stationary Office.

Directive 89/336/EEC EMC Directive

TSRGD The Traffic Signs Regulations and General Directions

APPENDIX A INFORMATIVE GUIDE

General

A1 This appendix is an informative guide to highway authorities who wish to purchase and use discontinuous variable message sign that has been declared compliant to this specification. Prospective purchasers should ensure that the contract specification provides details of the following:

- ◆ The supply requirements if these differ from the standard mains supply;
- ◆ The type of faults which are to be reported by the fault monitoring facility, e.g. heater faults, pixel, module failures etc.
- ◆ Whether flashing amber lanterns are required, if these are to be synchronised with other equipment, and if higher than normal flashing rates are necessary;
- ◆ The cable infrastructure requirements;
- ◆ The control system interface requirements;
- ◆ Details of any built-in legends and pictograms that are required;

Note: The purchaser should note the importance of ensuring legends and pictograms to be used are authorised before manufacture commences where these are not already prescribed by TSRGD

Marking and Labelling

- A2 The contract specification must call for each discontinuous variable message sign to be fitted with a CE Mark and label displaying following:
- i) The Product's unique identifier and serial number;
 - ii) The HA Specification to which it conforms;
 - iii) The foremost control and monitoring interface;
 - iv) The electrical supply requirements of the equipment.

APPENDIX Z TECHNICAL FILE CONTENT

This appendix defines the necessary content for a Technical File Pack (a collection of relevant documents) which must be reviewed by an appropriate Technical Assessor as part of the TOPAS Registration process (See TOPAS 0600).

Only the 'ticked' items are required to be present in a Technical File Pack used to support TOPAS Registration against TOPAS 2516B.

Ref	Item	Description	Required
1	Technical File overview document.	<p>A summary document outlining the product, specifying which TOPAS and other relevant specification(s) the product has been designed to comply with, together with a detailed table of contents for the Technical File Pack.</p> <p>Where copies of external certificates or documents are referred to these may be included within the Technical File overview document or supplied separately as part of the Technical File Pack.</p>	✓
2	QA accreditation certificate(s).	A copy of the Quality Management Registration Certificates for the organisation applying for TOPAS Product Registration.	✓
3	Details of all CE markings that apply to the product.	A list of all directives complied with and how achieved. Typically this would be references to explicit CE Technical Files and certificate's, copies of which would be included in the Technical File Pack.	✓
4	A functional design description of the product.	A reference to the overall System Design Documentation for the product (by document part number and issue).	✓
5	Product part numbers	A list of top level assembly part numbers and their issue states including all firmware / software part numbers and issues.	✓
6	Statement of compliance	A clause by clause statement of compliance against TOPAS 2516B confirming compliance and/or listing caveats or deviations.	✓

7	Test procedures and results	A reference to all test schedules and test result documents (by document part number and issue).	✓
8	EMC test results	A reference to EMC test performance requirements. Copies of the results of EMC testing undertaken by an appropriately qualified independent approved test house must be included in the Technical File Pack.	✓
9	Optical test results	A reference to Optical tests performance requirements. Copies of the results of Optical testing undertaken by an appropriately qualified independent approved test house must be included in the Technical File Pack.	✓
10	Environmental test results	A reference to Environmental tests performance requirements. Copies of the results of the Environmental testing undertaken by an appropriately qualified independent approved test house must be included in the Technical File Pack.	✓
11	Radio Agency test results	A reference to Radio Agency tests performance requirements. Copies of the results of Radio Agency testing undertaken by an appropriately qualified independent approved test house must be included in the Technical File Pack.	N/A
12	Primary Safety Test results	For Traffic Control equipment specifically a reference to the Primary Safety Test schedule and test results by part number and issue. A copy of the test results should be included as part of the Technical File Pack.	N/A
13	Failure Mode Analysis	A reference to the product failure mode analysis requirements and results by document part number and issue.	N/A